PROJECT: Example Problem Nomograph

STATION: Test

SHEET 1 OF 1

CULVERT DESIGN FORM

DESIGNER/DATE: _____ OF ____

REVIEWER/DATE: _____ OF ____

HYDROLOGICAL DATA

SEE ADDL. SHEETS

☒ METHOD: USGS

☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____

☐ CHANNEL SHAPE: _____

☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (m^3/s)	TW (m)
50	3.78	0.94
100	4.20	0.99

CULVERT DESCRIPTION: MATERIAL-SHAPE-SIZE-ENTRANCE	TOTAL FLOW Q (m^3/s)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS											CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
			INLET CONTROL				OUTLET CONTROL									
			HW_i/D (2)	HW_i	FALL (3)	EL_{hi} (4)	TW (5)	d_c	$\frac{d_c + D}{2}$	h_o (6)	k_e	H (7)	EL_{ho} (8)			
Trial 1: Single RCP or CMP 1500 mm	4.2	4.2	1.16	1.74	-	58.94		No	Good							Case 4
Trial 2: Single Deformed Conc. 2495 x 1585	4.2	4.2	0.75	1.19	-	58.39		No	Good							Case 4
Trial 2: Single CSP-A 1800 x 1200	4.2	4.2	1.55	1.86	-	59.06		No	Good							Case 4
Trial 3: RCB 3300 x 1200	4.2	4.2	0.71	0.85	-	58.05	0.99	0.52	0.86	0.99	0.5	0.12	58.22	58.22	1.29	Looks OK

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i/D = HW/D OR HW_i/D FROM DESIGN CHARTS

FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(3) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(4) TW BASED ON DOWNSTREAM CONTROL OR FLOW DEPTH IN CHANNEL

(6) h_o = TW or $(d_c + D)/2$ (WHICHEVER IS GREATER)

(7) $H = (1+k_e+(19.63\,n^2L)/R^{1.33})\,V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUSCRIPT DEFINTIIONS:

a	Approximate
f	Culvert Face
hd	Design Headwater
hi	Headwater in Inlet Control
ho	Headwater in Outlet Control
i	Inlet Control Section
o	Outlet
sf	Streambed at Culvert Face
tw	Tailwater

COMMENTS/DISCUSSION:

This is an approximate solution because box not flowing full. Check with microcomputer HY8 for exact solution.

CULVERT BARREL SELECTED:

SIZE: 3300 x 1200

SHAPE: RCB

MATERIAL: Concrete n: 0.012

ENTRANCE: Conventional Bevel

CHART 17 AND PERFORMANCE CURVE FOR DESIGN EXAMPLE

Figure 31-7A